

THE HEBRID FAUNA OF THE ETHIOPIAN KAFFA PROVINCE, WITH CONSIDERATIONS ON SPECIES GROUPING (HEBRIDAE, HETEROPTERA)

by

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ABSTRACT

Nine species of "velvet surface bugs" (Hebridae) are recorded from the area around Jimma, the capital of the Ethiopian Kaffa Province. Six new species are described. Four belong to the genus *Hebrus* (*H. bimaculatus*, *H. pseudopusillus*, *H. spinitibialis*, *H. gidshaensis*). The other two new species (*H. bongaensis*, *H. niemeri*) and *Hebrus pelengei* Poisson are assigned to *Hebrometra* n. gen., a taxon restricted to the sprinkle zone of waterfalls. Another new *Hebrometra* species is described from Malawi (*H. malawiensis*) which is considered an ancestral member of the *Hebrometra* clade. The phylogenetic significance of antennal, genital and external microcuticular characteristics of *Hebrus* and *Hebrometra* is discussed; arguments are given to abandon the current subgeneric splitting of *Hebrus*.

INTRODUCTION

Hebridae are very tiny (generally 1.5—2.5 mm), plumb-bodied predacious bugs living in clumps of mosses and other short hygrophilous vegetation or on bare, permanently moist soil along the margins of pools, ponds, rivulets or in marshes. The number of described species is approximately 150, but because of their size and obscure way of life probably many more species still have to be discovered. The family predominantly occurs in the warm regions, particularly of the Old World. The Hebridae form an interesting group in studies on the phylogeny of heteropterous families, since, as a representative of the major group Gerromorpha, it contains a number of archaic features (Cobben, 1968, 1978). Two of these original traits concern the habitually damp soil-substrate required for survival, and the carnivorous way of feeding with rasping-filing maxillary stylets (Andersen, 1979; Cobben, 1979).

The material described in this paper was collected near Jimma, the capital of the Kaffa Province in the southwestern part of Ethiopia, during a two month visit (Oct.-Nov.) in 1969. Up

to now some 40 hebrid spp. are known from Africa (inclusive of Madagascar), of which four occur in Ethiopia. The fact that I could sample nine species, six of them new, in an area of roughly 50 km radius around Jimma, demonstrates that the Ethiopian hebrid fauna is comparatively rich and still poorly known. Apart from the worldwide and largest genus *Hebrus* Curtis, the family contains some genera with only few species: *Merragata* White (Old and New World), *Hyrcanus* Distant, *Timasius* Distant, and *Timasiellus* Lundblad (restricted to the Oriental Region¹). So far only representatives of *Hebrus* have been recorded from Africa. In this paper some typical hebrid species will be described as new; four other species are recorded which warrant a separate generic status on the basis of some synapomorphic characteristics. Before treating the species collected, some antennal, genital and external micro-cuticular characteristics will be discussed in view of their importance for a future revision of the worldwide genus *Hebrus*.

DISCUSSION OF CHARACTERS

The antennae

Most African species have been described by the French specialist Poisson in a series of papers from 1934 onwards. In 1943 he first divid-

¹) Recently Andersen (1981), in a superb revision of the family, recognizes seven genera (*Hyrcanus*, *Merragata*, *Lipogomphus*, *Timasius* (with ten new species, mostly from India), *Neotimasius*, *Hebrus*, *Hebrometra* (see the present paper)).

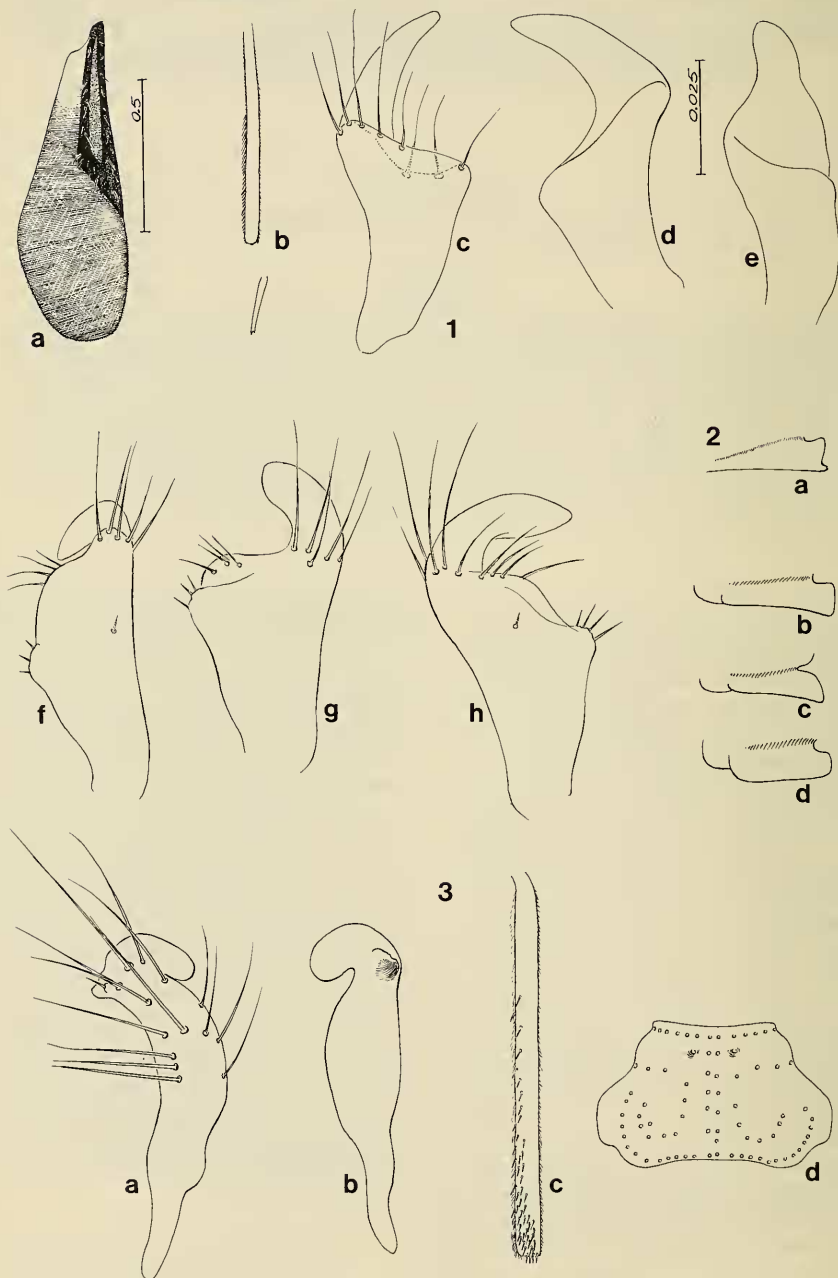


Fig. 1. *Hebrus gerardi*; a, right fore wing of ♂; b, hind tibia of ♂ with row of incised spines; c—e, paramere of specimen from Ethiopia; f—h, paramere of two specimens from Ivory Coast. Fig. 2. Left view of buccula of: a *Hebrus gerardi*, b, *Hebrus katompei* and *Hebrus pseudopusillus*; c, *Hebrus pusillus*, *Hebrus gidshaensis*, and *Hebrus spinitibialis*; d, *Hebrus bimaculatus*. 3. *Hebrus bimaculatus*; a, b, paramere; c, hind tibia of ♂; d, pronotum.

ed the genus into the subgenera *Hebrusella* and *Hebrus* s.s. The first subgenus has five distinct antennal segments, whereas representatives of the second seem to possess only four segments when superficially viewed. The last segment in this latter species group reveals a peculiar differentiation half-way, rightly circumscribed by Poisson (1955a) as "une zone de chitine souple vaguement annelée sans noeud articulaire". This differentiation was already noted by Lundblad (1933) ("mit einer falschen Gelenkverbindung"). I adopt here the term "pseudoarticulation" (Miyamoto, 1965) since it indeed has no articulatory function. This point of weakness enables the apex of the antennae to vibrate in air currents and it is easily broken off during ultrasonic cleaning. The pseudoarticulation has an uninterrupted continuation of setae, and is merely perceptible in scanning-micrographs as an area with weak, transverse striation (fig. 49). Under transmitted light, there appears to be a thin transparent outer cuticle, whereas the sclerotized inner cuticle is broken up by obliquely spiralling strips (fig. 11b.).

Poisson (1955b) described *Hebrus houti* from S. Africa having four simple antennal segments without any sign of subdivision of the last one, and placed it in a new subgenus *Subhebrus*. He described it again as new subgenus in 1957 with the note that the reduction of antennal segments is undoubtedly of secondary nature. I doubt this very much since four-segmented antennae occur in the hebrid genera *Hyrceanus* and *Merragata*, and in all other families of waterstriders. This nodal number is found further in all other major groups of Heteroptera with the exception of most Pentatomidae (second segment divided) and some reduviid taxa (many subdivisions either of the 2nd or 4th segment) (Miller, 1956). It is therefore more likely that the pseudoarticulation in Hebridae is a transitional state towards the 5-segmented condition (all larval instars of the subgenus *Hebrus* lack the pseudoarticulation!). A pseudojoint is also found in the hebrid genus *Timasius* (Miyamoto, 1965) and even in *Madeovelia* (Poisson, 1959) which is affiliated with the Mesoveliidae (Cobben, 1968; Andersen & Polhemus 1980). Outside the Hebridae, a pseudoarticulation is also present in the Paraphrynoveiliidae (Andersen, 1978), and in Hydrometridae (*Heterocephis*, Andersen personal comm.). Thus, there is evidence that this tendency for duplication of the last segment evolved more than once independently. Its presence or absence alone is then not reason enough

for subgeneric delimitation. The problem of subgeneric divisions within *Hebrus* is further complicated by three additional subgenera from Africa and Madagascar: *Paratimasius* Poisson, 1952, *Timasielloides* Poisson, 1952, and *Paratimasiellus* Poisson, 1956. These have also the antennal construction of the subgenus *Hebrus*, and moreover some other external features, which on the basis of the descriptions seem too weak and not discontinuous enough to warrant subgeneric status.

Male genital structures

Realizing that the characters used for the present subgeneric grouping of species could be liable to parallelisms, I paid particular attention to the male genitalia of the Ethiopian and European species, since in other families these structures have been proven to be of great value in supraspecific ranking. The symmetrical parameres of Hebridae are already generally used for the diagnoses of species, although Lundblad (1933) has already stressed that their shape is highly dependent on the angle under which it is viewed. One picture from a fixed angle or various pictures of the same paramere (e.g. fig. 1f—h) are therefore necessary for adequate comparisons between species. The three-dimensional shape and vestiture of typical hebrid paramere (*Hebrus pusillus*) is shown in the SEM microphotographs of figs. 54—56. The outer surface of the hooked paramere is densely beset with long hairs (fig. 54). The inner surface has a group of three pegs and a perpendicular squamous outgrowth. This latter protuberance bears three sensillum-like structures (figs. 56, 57) which obviously play a role when touching the female ovipositor. Such microstructures deserve attention in future comparisons between other hebrid taxa.

The intromittent male organ of Hebridae has never been studied for the purpose of unravelling intrafamilial relationships, presumably because of its very tiny dimensions (the not inflated phallus measures only 0.1—0.2 mm). My earlier experience when comparing genitalia in most heteropterous families (see Cobben, 1978, for the diversity within the families of waterstriders) concerned only *Hebrus ruficeps* from Europe. It belongs to the subg. *Hebrusella* sensu Poisson with five fully developed antennal segments. The phallus which can be inflated by slight manual pressure on the abdomen, as in most Gerromorpha, unfolds a very simple composition (fig. 22). Inflation is simply brought

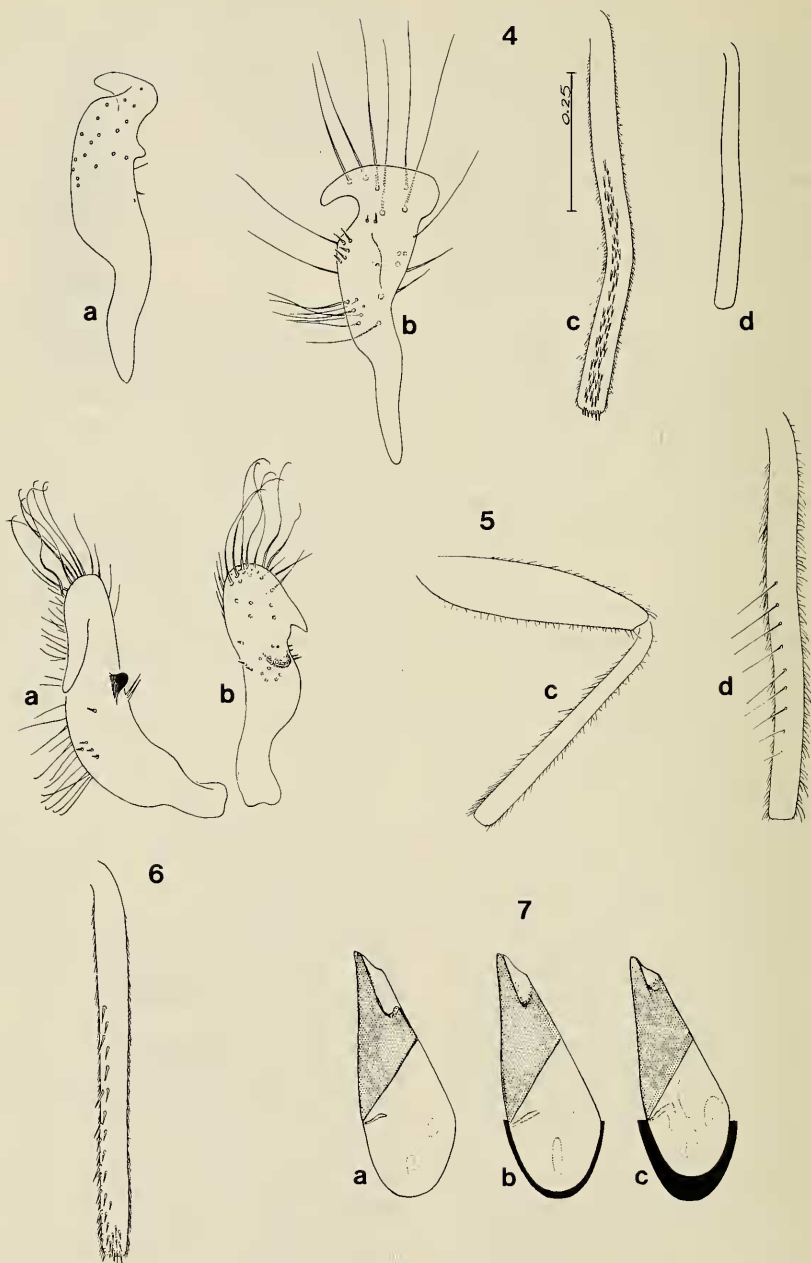


Fig. 4. *Hebrus katompei*; a, b, paramere; c, hind tibia of ♂; d, hind tibia of ♀. Fig. 5. *Hebrus pusillus*, specimens from the Netherlands; a, b, paramere; c, front leg of ♂; d, hind tibia of ♂. Fig. 6. *Hebrus pseudopusillus*, hind tibia of ♂. Fig. 7. Left fore wing of: a, *Hebrus bimaculatus*; b, *Hebrus katompei* and *Hebrus pseudopusillus*; c, *Hebrus spinitibialis* (black area represents circumference of abdomen; similar *Hebrus gidshaensis*, but smaller proximal white spot).

about by blood pressure into the endosoma. The ductus seminis is very thin and runs entirely free through the simple basal articulatory apparatus, phallosome and endosoma. The latter is more than four times the length of the phallosome in which it is folded during rest. It is bilaterally symmetrical and is divided in a long proximal cylindrical conjunctiva and a distal vesica with several pairs of swellings. Two lateral crescent-shaped sclerites support the basis of a pair of preapical flap-like extensions. These sclerites are well-discernible in the phallus if the entire endosoma, being out of function, is retracted (vss in figs. 23, 24).

Some of the Ethiopian species, however, have more complex internal endosomal equipment, occurring also in the second northern-European species *H. pusillus*, belonging in the subgenus *Hebrus* sensu Poisson. Instead of just two supporting sclerites there are two more sclerotized thickenings leading each to an undulating apical process. The greatest difference with the *Hebrusella*-type, however, are two sclerotized threads extending from two invaginated lobes with which they form a proximal loop (es in figs. 24, 25). The SEM micrographs (figs. 58, 59) show these struts very clearly after rupture of the vesical membrane.

The function of the struts becomes clear when pairs in copula are studied (figs. 28, 29; the fixed material was kindly put at my disposal by Mrs. Karin Hemming-v. Battum). They apparently serve as a more solid expansion of the vesica, the loops being pressed against the ventral wall of the female gynatrium. The result is that the secondary gonopore of the phallus takes a fixed position close to the gutter-shaped wall thickening (gwth in fig. 29) which leads to the entrance of the tubular spermatheca for receiving the sperm. Figs. 27b—d further show that during copulation the male genital segments are rotated through an angle of 90°, that only one paramere is functioning as a clasper, and that the phallus is inserted into the apical region of the ovipositor.

The striking discrepancies in phallic structures mentioned above for *H. (Hebrusella) ruficeps* and *H. (Hebrus) pusillus* could enhance subgeneric differences. However, although the *pusillus* phallic type seems to be restricted to the subgenus *Hebrus* having the pseudoarticulatory antennal joint, some of the Ethiopian spp. do have the endosomal looped struts, while other related spp. do not possess them. The Ethiopian material further contains some species with a fa-

cies unlike typical *Hebrus* (described below as a new genus), but with the antennal structure of the subgenus *Hebrus* type. Nevertheless, their endosomal structures are very simple and without sclerotic struts.

Microsculpture of the dorsal integument

The shape of pronotum and scutellum, and the distribution of deep cuticular pits on it, are commonly used in the literature for the diagnoses of species. Often it is not clear whether the pictures given are from dry material or from specimens in preservative fluid. In the former case, some pits are easily overlooked. One or two specimens of the species listed below were studied with the scanning electron microscope. The resulting pictures, made under proportionally low magnification, were compared with light optical observations of additional material for allowance of generalizations to be made on constant features by species. The purpose was to analyse whether the micro-level might reveal differences in species-group categories. As discussed above, the species grouped under the *Hebrusella*- or *Hebrus*-type have different antennae. The integument of head and thorax reveals the following three discrepancies between both groups. The row of bare spots on the median line of the vertex, representing internal muscle insertions of the pharynx pump, is proximally marked by one deep pit (figs. 41, 50) in all species of the *Hebrus*-type studied. In *H. gerardi* (fig. 30) and in *H. ruficeps*, representing the *Hebrusella*-type of species, this pit is lacking. In the latter group, the pronotal pits bear a central projection, mostly cylindrical (figs. 31—35), whereas in the *Hebrus*-type species studied, these pits are bordered with a fringe of microtrichia and lack a central projection (figs. 37, 43). The mid-dorsal pronotal pits in the *Hebrusella*-type (fig. 30) are lower in number than in the *Hebrus*-type species (figs. 36, 47, 51). The function of such pits, which are often associated with particular, probably sensillar structures in other families (see Cobben, 1978: 159—164), is not clear. The three species group dividing characters should be compared in more species in order to test their general validity.

The external cuticular surface of water striders is of a complex nature, predominantly serving as a water-proof coat (Andersen, 1977; Cobben, 1978). The basic pattern of sculpture is rather uniform in all hebrid species studied, consisting of a thick layer of microtrichia, often with intertangled apices (figs. 39, 44). Within

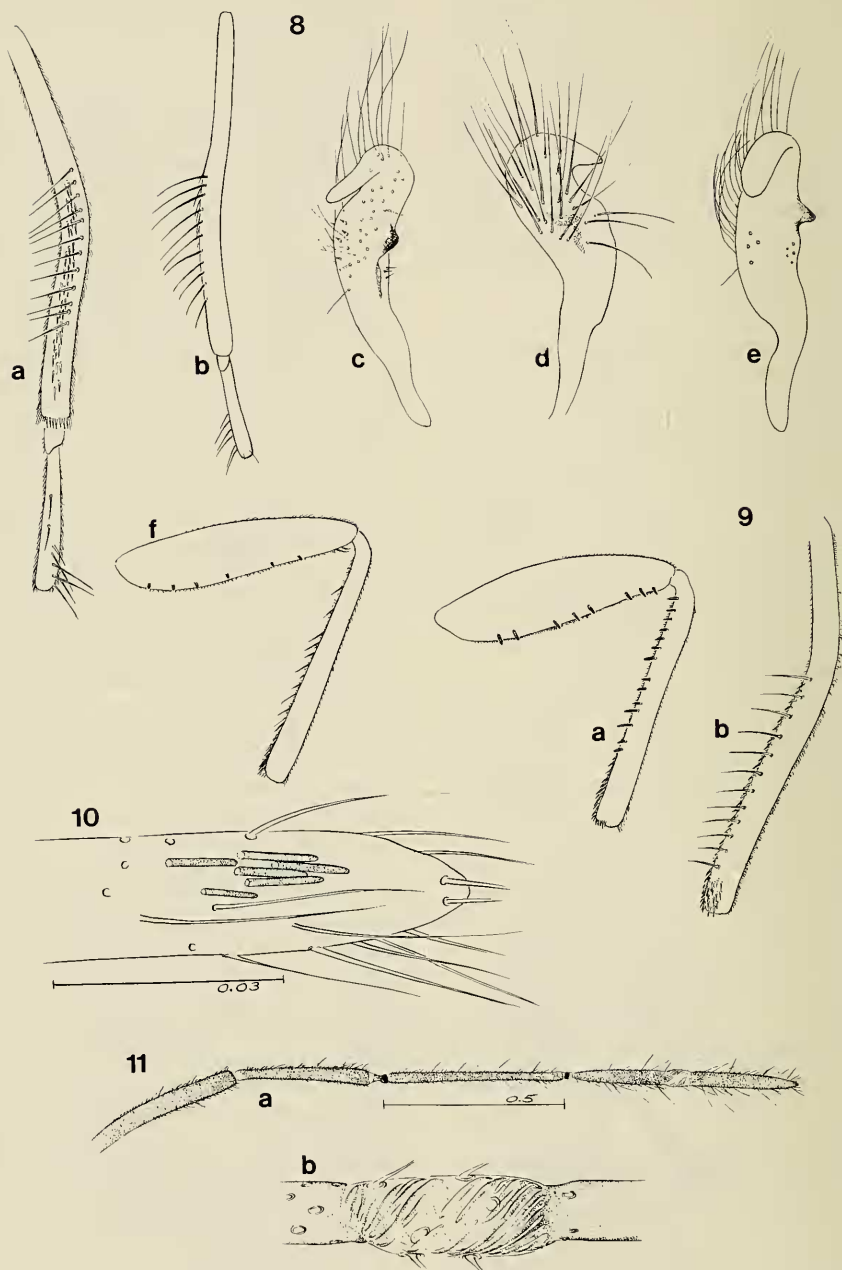


Fig. 8. *Hebrus spinitibialis*; a, b, hind tibia of ♂, in lactic acid slide (a), dry (b); c—e, paramere; f, front leg of ♂. Figs. 9—10. *Hebrus gidsbaensis*; a, front leg of ♂; b, hind tibia of ♂; 10, apex of antenna, ventral, with the patch of sensory pegs, occurring in all Ethiopian *Hebrus* species. Fig. 11. *Hebrometra niemei*; a, antenna; b, pseudoarticulation of last segment.

this layer, so-called "peg-plates" (Andersen, l.c.) or sieve-pores (Cobben, l.c., possibly representing outlets of epidermal glands) are distributed (figs. 38, 39, 43—45, 52, spherical rims including a group of conical pegs). Other cuticular extensions are mushroom-like, calyx-like, shoe-lift-like and slender macrotrichia with fluted surface (figs. 32, 39, 44, 52). Shoe-lift structures with a slender form occur in the species *bimaculatus*, *pseudopusillus* and *katompei*, and with a tapering form in the species *spinitibialis* and *gidshaensis*. They are absent in the new genus, described below, and in the *Hebrusella*-type spp., *H. gerardi* and *H. ruficeps*. The latter two species possess calyx-like structures instead.

From the foregoing it seems provisionally recommendable not to use the antennal and phallus structures mentioned as the only subgeneric criteria within the large group of otherwise typically shaped *Hebrus* species. Another reason is the apparent absence of clear ecological differentiation between the species having four, five or an intermediate number of antennal segments. For convenience, however, I will indicate in the descriptions of species given below the stage of antennal development between brackets: (*Hebrus*-type fourth segment not completely subdivided) or *Hebrusella*-type; with five segments).

SURVEY OF THE ETHIOPIAN SPECIES

The following four species have been recorded so far from Ethiopia.

H. alluandi Poisson, 1943. Addis Ababa (Poisson, 1955a: 154); Galla Lieca (Mancini, 1961: 41); also known from Kenya.

H. mancini Poisson, 1955. Addis Ababa (Poisson, 1955a: 154—155) (= *Hebrometra pelengei* (Poisson, 1954), see this paper).

H. jeanneli Poisson, 1943. Gembi near Agaro, 1963 (Linnavuori, in litt.); also known from E. Africa.

H. violaceus somaliensis Poisson, 1953. Sululta, 1963 (Linnavuori, in litt.); known from Somalia; the nominate form is widespread in East and South Africa.

I collected in the habitats around Jimma nine species. Six species belong to *Hebrus*, four of which are described as new. Three other species, two of which are new, are deviative enough to erect a new genus for them.

HEBRUS Curtis, 1833

Hebrus (*Hebrusella*-type) *gerardi* Poisson, 1950

(figs. 1, 2a, 30—35)

General colour dark brown; vertex behind ocelli, inner margin of eyes, collar and anterior mid part of pronotum light brownish; anterior half of endocorium strikingly white (fig. 1a); membrane unicolorous dark fuscous in ♂, with four vague lighter spots in ♀. Upper side without distinct hairs, except for the three pairs of long, white cephalic trichobothria and the light hairs on the corial veins. Antennal formula (2♂, 1♀): 4:4—4.3:5—6:4—4.5:4—5.5. Extremities yellowish brown. Tibia 3 of ♂ very slightly curved; innerside with a row of spines extending from before the middle towards the apex, the spines being incised on top (fig. 1b). Buccula and paramere as figured (figs. 2a, 1c—e). Length of 2♂ 1.7—1.8, of ♀ 1.9 mm.

Material: 1 ♂, 1 ♀, Jimma, Hippo Lake 27.x.1969; 1 ♂, idem, 28.xi.1969, on open wet sandy soil with sparse short grasses.

This is apparently the rarest species in the Kaffa province. The three specimens were collected at one spot within an extensive marshy area where three other *Hebrus* species were abundant. I attribute this species provisionally to *H. gerardi* Poisson, described from Zaïre (1 ♂) in 1950. Poisson (1957b) recorded additional material from the same region, and Linnavuori (in litt.) from Nigeria and Sudan. The long row of incised spines of the hind tibia is characteristic, but the paramere and the antennal formula presented in the papers of Poisson deviate somewhat from the Ethiopian specimens. Poisson's drawing of the wing shows hairs on the endocorium, whereas in my material this wing area is entirely glabrous. I collected in the Ivory Coast (Bouaké, iv.1964) a series which conforms externally quite well with the Ethiopian animals. The parameres, however, reveal differences in shape and placement of spines (fig. 1f—h). Future studies of material from other parts of Africa will be necessary for a right taxonomic interpretation of the geographic differences mentioned. Hoberlandt (1950) described *H. wygodzinskyi* from Angola. This species is close to *H. gerardi*, but the mid part of the hind tibia is broadened, bearing a short row of pointed spines. This condition being quite different in

H. gerardi, I am inclined to consider *H. wygodzinskyi* a valid species rather than a subspecies of *H. gerardi*, as was proposed by Poisson (1957).

Species 2—6,

The following five species are externally very much the same and close to the Palaearctic *Hebrometra pusillus* and associates. The sequence of the species treated below follows the increasing differentiation of the fore and hind leg of the males, which are undoubtedly related with the copulatory act. The hind femur of *H. pusillus* is strongly arched; the hind tibia is weakly sinuate

and bears a row of some nine long spiny hairs on the medio-dorsal surface (fig. 5d). This setal comb has not been mentioned in the literature (e.g. Jordan, 1954; Stichel, 1955, Poisson, 1957). Since *H. pusillus* also has been recorded from North Africa, material identified as such should be carefully restudied for the shape and pilosity of the tibiae, and the presence of the phallic struts.

The attribution of single females to their proper male sex is another complication. Generally, species of which males have clearly arched hind tibiae, the corresponding females have also sinuate hind tibiae, though less marked. There

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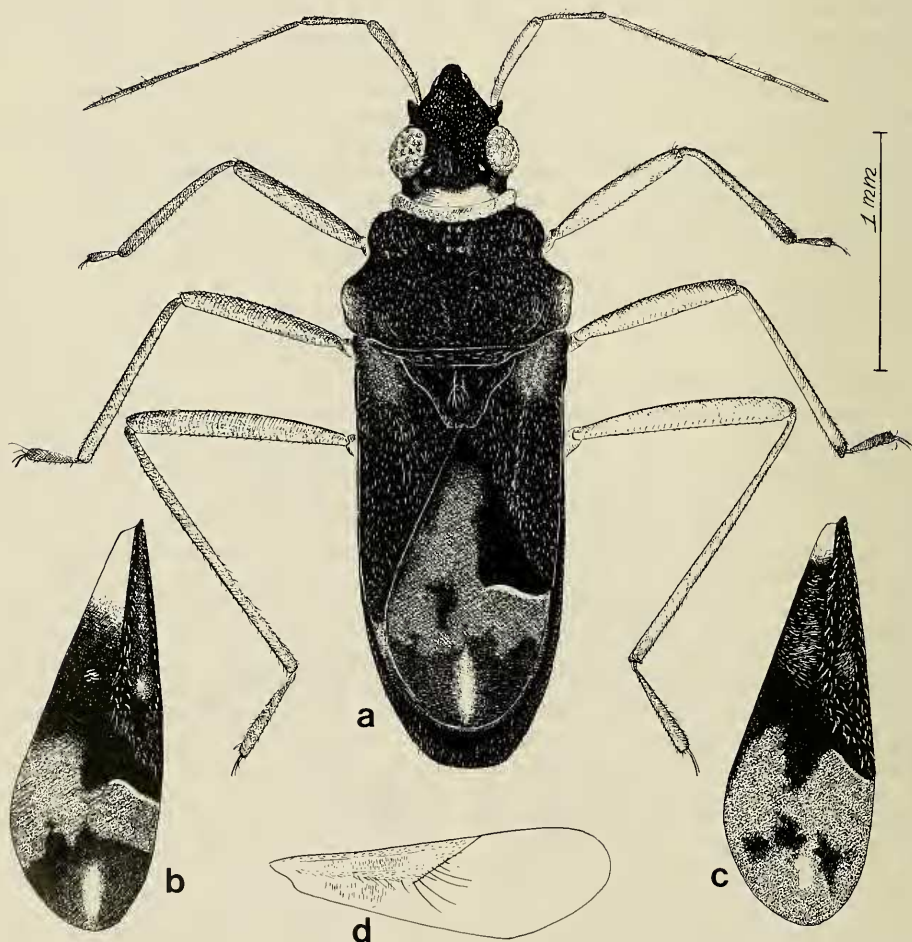
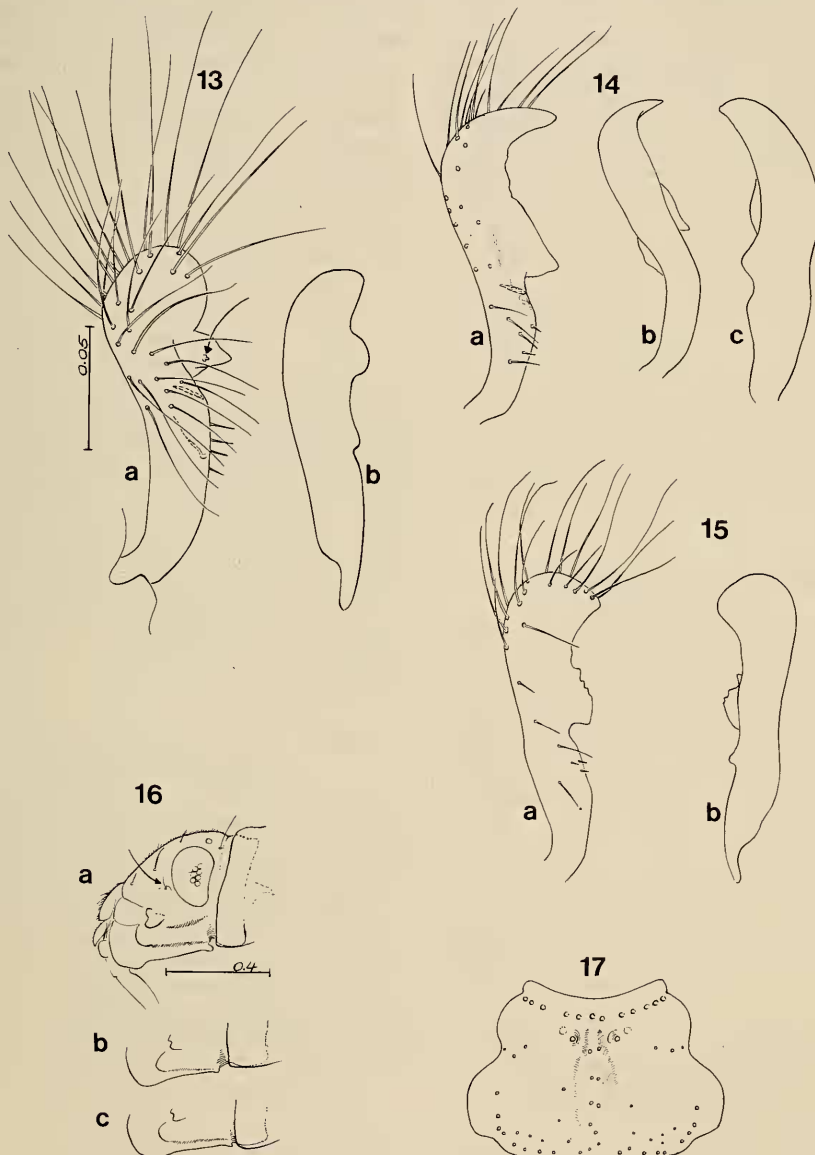


Fig. 12. *Hebrometra* n. gen.; a, *H. bongaisensis*, ♀; b, right hemielytron of *H. pelengei*; c, d, right hemielytron of *H. niemeri* (c, specimen from Natal, d, from Tanzania, East Usambara Mts.).

appears, however, no regularity in this sexual difference in closely related species. For example, the ♂ of *H. spinitibialis* has conspicuously arched hind legs, whereas the ♀ has straight hind tibiae. The hind tibia of the ♀ of *H. katompei* is, on the contrary, sinuous, whereas the

male hind tibia is much less arched than in *H. spinitibialis*. Such relations make the complete definition of species, which often occur together, very difficult. It took me some effort to make the right conspecific combinations between males and females. The shape of the buc-



Figs. 13—15. *Hebrometra*, right paramere; a, dorsal, b, other view; 13a, b, *H. bongensis* (arrow points to sensillum); 14a—c, *H. pelengei*; 15a, b, *H. niemeri* (specimen from Natal). Fig. 16. Left profile of head; a, *H. bongensis* (arrow points to setiferous tubercle); b, *H. niemeri*; c, *H. pelengei*. Fig. 17. Pronotum of *H. bongensis*.

culae, not liable to sexual differences, is an inadmissible help in this dilemma.

Another severe source of confusion is the antennal formula. I compared my measurements on known species with the data from the literature, and found many incongruences. In the formulae given, the length of the internodal joints is usually indicated separately. Because of the small sizes, I think that it is more preferable to take the length of each segment inclusive of the basal internode and to measure the last segment with the pseudojoint as a single unit. My calculation of the ratios of the segments of European *H. pusillus* (mean of five specimens) resulted in the formula: 7.4:7:10, whereas the recalculation of Poisson's (1943) formula reads: 4.4:4:6.2:10, thus a considerable shorter first segment. The formula given by Jordan (1954) is: 5.4:6:9.

Because of all the difficulties mentioned above, it is clear that earlier descriptions of species belonging in this complex may not give all the essential information. I tried to make the right nomenclatorial decisions on the species listed below. The type material in the private collection of Poisson being not available for study, I had to rely mostly on his original descriptions.

Hebrus (Hebrus-type) bimaculatus n.sp.
(figs. 2d, 3, 7a)

General facies of the *pusillus* group. Pronotum black with a weak shine of metallic blue. Proximal half of endocorium milky white and hairless (fig. 7a). Buccula extending ventrally beyond the level of the ventral head lobe (fig. 2d). Paramere as drawn in fig. 3a, b. Antennal formula (mean of 3 ♂ and 2 ♀): 7.5—8:5.5—6:6:11.5—13.5. Hind tibia of ♂ and ♀ straight (fig. 3c). Length of 4 ♂: 2.4—2.5 mm, of 2 ♀: 2.5—2.6 mm.

Holotype ♂: 70 km from Jimma on the route to Addis Ababa, 23.x.1969. Paratypes 3 ♂, 2 ♀, idem. At the bottom of deep narrow ravine in sprinkle zone of waterfall, restricted to the north side on loamy soil, which received the heat of the afternoon sun. Holotype and paratypes in the author's coll.; paratype in the Muséum National d'Histoire Naturelle, Paris.

The shape of the paramere is like that of *H. caeruleus* Poisson, 1934, as figured in Poisson (1943). This species (later spelled *H. coeruleus*) is recorded from the Cape Province, S.W. Africa, Angola, Mozambique, Equatorial and East Africa (Poisson, 1934, 1943, 1957; Hoberlandt, 1950; Linnavuori, 1971). I had the opportunity

to study the ♂ holotype and one ♀ paratype Muséum National d'Histoire Naturelle, Paris. The third antennal segment of *H. caeruleus* is 1.5 times the length of the second ($1.6 \times$ according to Poisson, 1934), whereas these segments are subequal in *H. bimaculatus*. The buccula of *H. caeruleus* is rather of the *pusillus*-type (fig. 2c), and the total length of about 2 mm is smaller than in *H. bimaculatus*. The metallic colour tends to blue in *H. bimaculatus* and to green in *H. caeruleus*. It is possible that the two specimens from Addis Ababa and Galla Lieca, identified as *H. alluaudi* Poisson by Poisson (1955) (Mancini, 1961), are identical with this or the next species. In *H. alluaudi* the third antennal segment should be longer than the first segment. Both specimens (in Museo Civico di Storia Naturale, Genoa) are females and lack the antennal segments 3 and 4. In his table to the African species, Poisson (1943) contrasted the brilliant metallic colour of *H. caeruleus* against the black colour with some violet reflection in *H. violaceus*. *H. bimaculatus* n. sp. conforms in this respect with *H. violaceus* and also with *H. violaceus somaliensis* Poisson and *H. vaillanti* Poisson, 1953, but unlike these species possesses straight hind femora. *H. bimaculatus* is very close to *H. pseudopusillus* n.sp., with which it was found together at the type locality. Apart from the differences in the paramere and buccula, the white endocorial base in *H. pseudopusillus* is smaller and bears some minute hairs (fig. 7b).

Hebrus (Hebrus-type) pseudopusillus n.sp.
(figs. 2d, 6, 7b, 36—39)

Characterized by straight hind femur and hind tibia, also in the male (fig. 6). Otherwise it has the aspect of *H. pusillus*. The paramere is like that of *H. spinitibialis* n.sp. (fig. 8c—e), and resembles that of *H. pusillus* (fig. 5a, b), but with the apical bristles not curled. In contrast to *H. pusillus*, the penis lacks sclerotic looped struts (see page 5). Antennal formula of five specimens: 6.5—7:4.5—5:7:10—11.5 (not different from *H. pusillus*). Ground-colour blackish, corial area between the veins dark, legs pale white with fuscous knees, apex of metanotum incised (fig. 37). In *H. pusillus*: ground-colour brown, area between wing veins light, legs unicolourous yellow brown, metanotal apex not incised. The general aspect of *H. pseudopusillus*, straight hind tibia and shape of the paramere is much like in *H. campestris* Linnavuori, 1971 (described as a subspecies of *H. soudani* Pois-

son, but now considered a valid species, Linnavuori, 1980). In contrast, however, *H. campestris* is about 0.2 mm smaller and it possesses the looped penis struts (checked in 2 paratypes). Length of 5 ♂: 2—2.3 mm, of 5 ♀: 2.2—2.4 mm (*H. pusillus* is generally 0.2 mm smaller).

Material. Holotype ♂: Jimma, Hippo Lake, 27.x.1969. Paratypes: Idem, x and xi, 1969, 19 ♂, 16 ♀; Jimma, waterfall, 5.x.1969, 2 ♀; Jimma airport, 17.xi.1969, 4 ♂, 2 ♀; Jimma, 30 km en route to Addis Ababa, 23.x.1969, 3 ♂, 6 ♀; idem, 40 km en route to Addis Ababa, 6.xi.1969, 3 ♀; idem, 70 km en route to Addis Ababa, 23.x.1969, 8 ♂, 4 ♀; Bonga, 29.x.1969,

1 ♂, 2 ♀; Bonga waterfall, 6 ♀; Bonga, 8 km en route to Jimma, 19.xi.1969, 1 ♀. Holotype and paratypes in author's coll.; paratypes in the coll. of Linnavuori, the Africa Museum, Tervuren, the Muséum National d'Histoire Naturelle, Paris, the Zoologisk Museum, Copenhagen, and the Rijksmuseum van Natuurlijke Historie, Leiden.

This is the most common species in the region investigated. It occurs in a wide variety of habitats, muddy places without running water, along rivulets, in a wet marl ditch and near the sprinkle zone of waterfalls. The often simultaneous occurrence with other species of the same

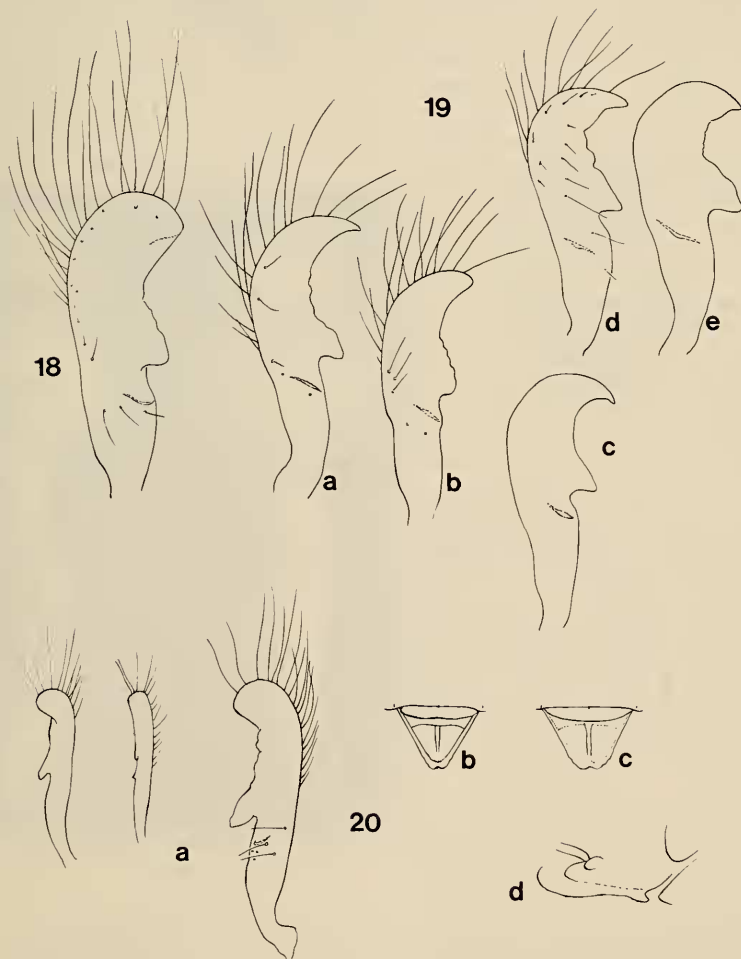


Fig. 18. Paramere of *Hebrometra pelengei*, paratype. Fig. 19. Parameres of *Hebrometra niemeri* from Tanzania; a—c, Usumba Mts.; d, e, Mt. Rungwe. Fig. 20. *Hebrometra malawiensis*; a, paramere; b, pseudoscutellum (compared with that of other *Hebrometra*, c); d, buccula.

species group, such as *H. katompei* and *H. spinitibialis*, makes recognition of single females difficult. Females of *H. pseudopusillus* are distinguished from females of other species by the following combination of characters: shape of buccula (fig. 2b), wing-design (fig. 7b) and straight hind tibia.

Hebrus (*Hebrus*-type) *katompei* Poisson, 1950
(figs. 2b, 4, 7b)

Specimens available from the surroundings of Jimma are most probably conspecific with *H. katompei*, described after 1 ♂ from Zaïre. The curvature of the ♂ hind tibia (fig. 4c) and the paramere (fig. 4a, b) agree with the figure in Poisson (1950). The antennal formula of 3 ♂ and 2 ♀ is: 6—7:5—6:6—8.5:10—11.5. The recalculated formula of Poisson reveals a proportionally smaller second segment (5.9:4.1:5.9:9.8). The dorsal surface of the hind tibia of the male has a narrow band of short spines (fig. 4c), which is not figured by Poisson, probably because he studied his material under lower magnification. Otherwise, the species is very close to *H. pseudopusillus* (the same type of buccula, fig. 2b), but in contrast with this species it possesses the phallic looped struts, as in *H. pusillus*. The female of *H. katompei* is only recognizable as such on the basis of the buccula (fig. 2b) and the weakly curved hind tibia (fig. 4d); metanotum broadly, but shallowly incised apically (fig. 40). Another species having the hind tibia curved in the male sex and the paramere more or less shaped as in *H. katompei*, is *H. mizae* Hoberlandt, 1950, from Angola. The antennal formula, however, is deviative (6.1:4:3.5:9.2), the pubescence more dense, and the hind tibia straight in the ♀.

Material: Jimma, Hippo Lake, x-xi, 1969, 15 ♂, 8 ♀; Jimma, 14.xi.1969, 23 ♂, 21 ♀; Jimma, airport, 17.xi.1969, 3 ♂; Jimma, waterfall, 5.x.1969, 3 ♂, 2 ♀; Bonga, 8 km in direction of Jimma, 19.xi.1969, 2 ♂, 1 ♀ (in the author's coll.).

Hebrus (*Hebrus*-type) *spinitibialis* n.sp.
(figs. 2c, 7c, 8, 41—46)

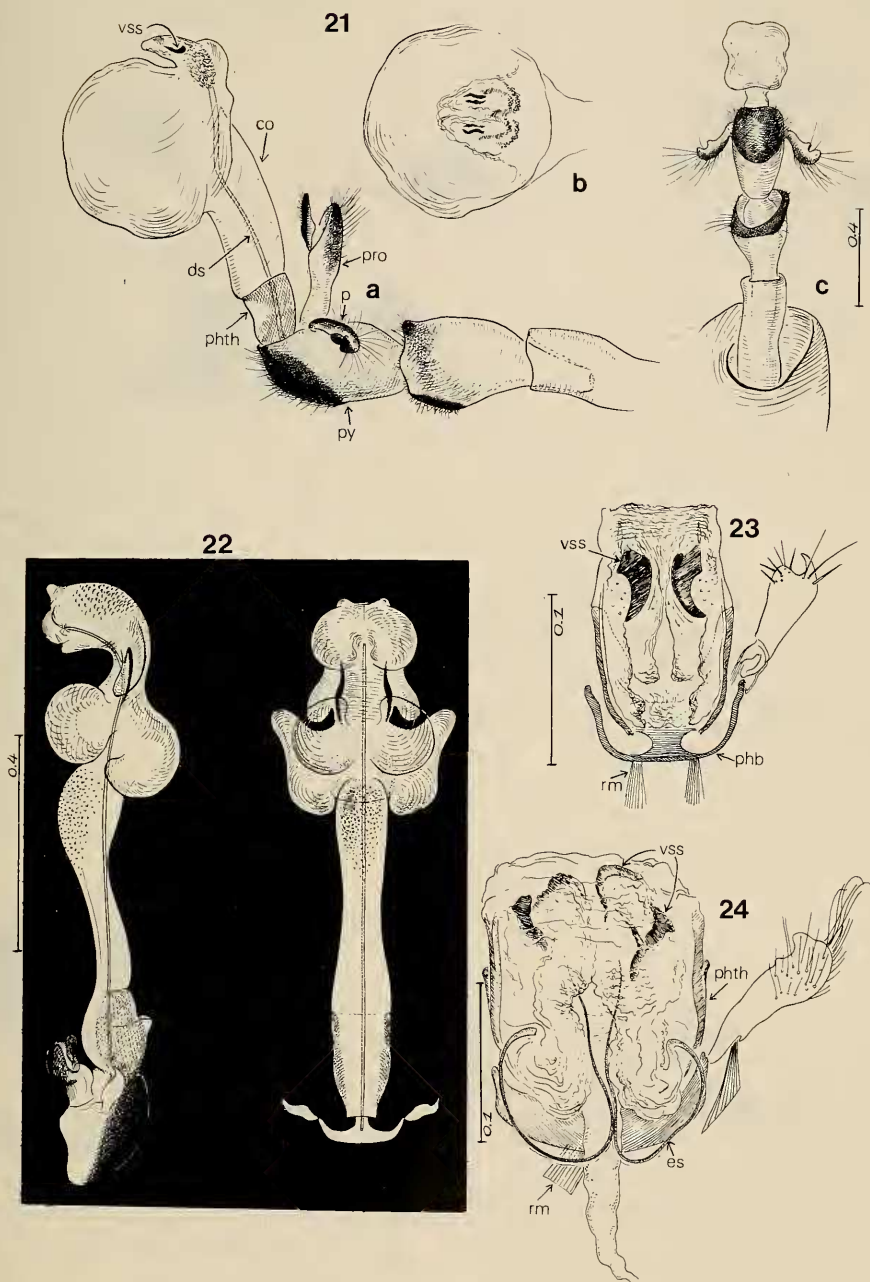
Close to *H. pusillus*, from which it differs in the following respects as far as the male is concerned: hind tibia conspicuously curved with a medio-dorsal row of some twelve long spines (figs. 47, 8a, b; note that the aspect appears quite different when the leg is slide-mounted (fig. 8a), or when viewed dry (fig. 8b)), hind tarsus with a group of long, extending setae; front

femur with six pegs, front tibia with a ventral row of oblique spines (fig. 8f); paramere with apical setae not curled (fig. 8c—e); penis without looped sclerotic struts. Wings somewhat reduced, not covering the entire abdomen, membrane with four light areas (fig. 7c). For cuticular differentiations, see the scanning micrographs (figs. 41—45). In *H. pusillus* these characters are: male hind tibia only weakly curved, with nine less firm spines (fig. 5d), front legs without pegs and spines (fig. 5c), paramere with curled hairs (figs. 5a, b), penis with looped sclerotic struts. Buccula of *H. spinitibialis* (fig. 2c) and straight hind tibia of female similar as in *H. pusillus*. The antennal formula of 5 ♂ and 5 ♀ is: 7:5—6:7—8:10—11; thus the length of the second segment is proportionally longer ($0.73 \times$ the length of segment 3) than in *H. pusillus* ($0.57 \times$). The dorsal pubescence in *H. spinitibialis* is slightly more dense and longer than in *H. pusillus*. The major part of the endocorium and the area between the exocorial veins is light in *H. pusillus*, whereas only a very small basal part of the endocorium is whitish in *H. spinitibialis* (fig. 7c).

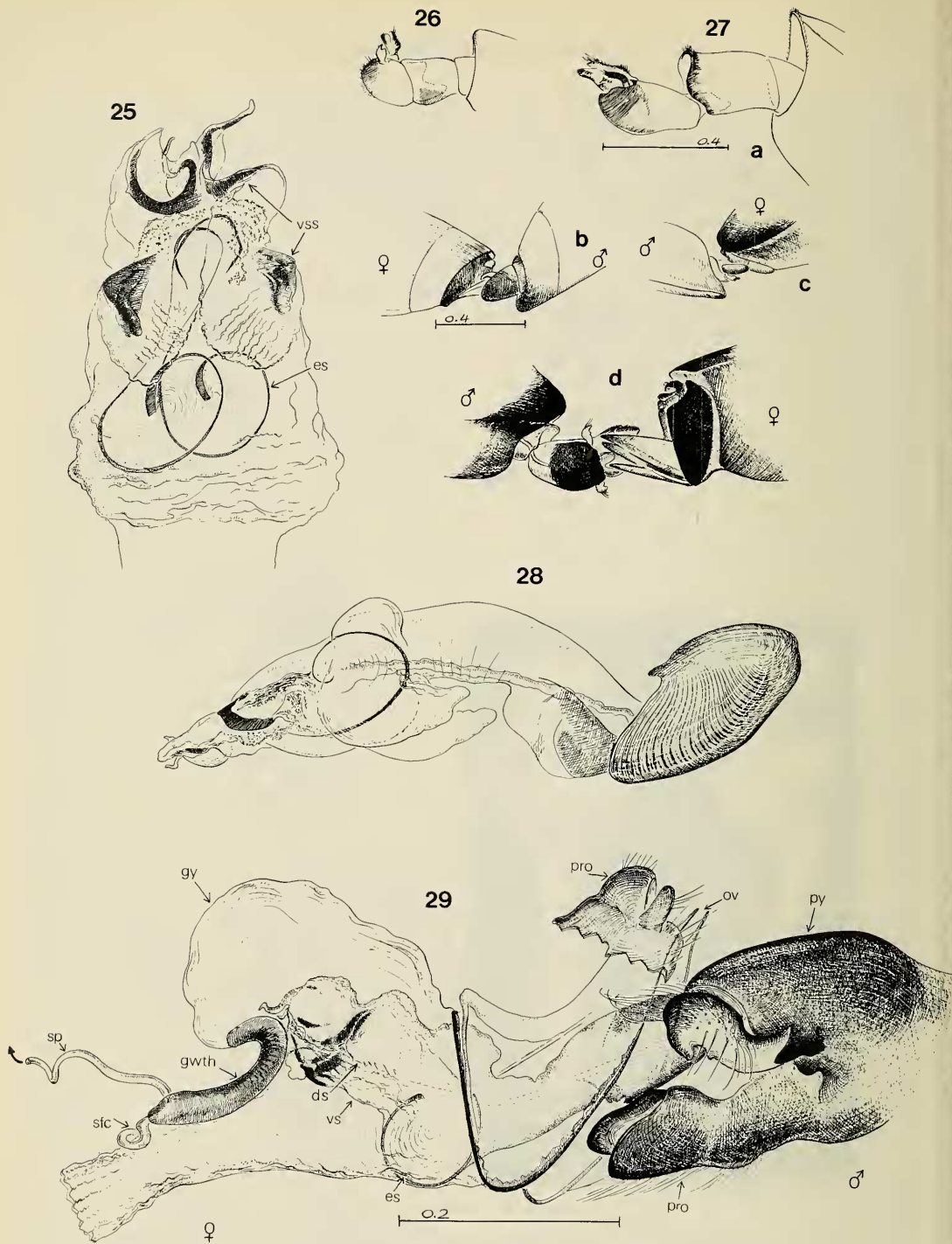
Material. Holotype ♂: Jimma, Hippo Lake, 5.xi.1969. Paratypes idem, 3 ♂, 1 ♀; idem 27.x.1969, 1 ♂, 1 ♀; Jimma, 14.xi.1969, 15 ♂, 7 ♀; Jimma, airport, 17.xi.1969, 2 ♂, 2 ♀; Jimma, waterfall, 5.x.1969, 2 ♂, 1 ♀; Jimma, 70 km en route to Bonga, 15.xi.1969, 1 ♂; Jimma, 70 km en route to Addis Ababa, 23.x.1969, 2 ♀; Bonga, along rivulet on chalky loam, 29.x.1969, 10 ♂, 14 ♀; Bonga waterfall, 22.xi.1969, 5 ♂, 6 ♀; Bonga, 8 km en route to Jimma, 19.xi.1969, 2 ♂, 1 ♀; Gidsha valley, 2400 m, 23.xi.1969, 1 ♂; Shappa, 7 km from Bonga, xi, 1969, 5 ♂, 6 ♀. Holotype and paratypes in the author's coll.; paratypes in the coll. of Linnavuori, the Africa Museum, Tervuren, the Muséum National d'Histoire Naturelle, Paris, the Zoologisk Museum, Copenhagen, and the Rijksmuseum van Natuurlijke Historie, Leiden.

Hebrus (*Hebrus*-type) *gidshaensis* n.sp.
(figs. 2c, 7c, 9, 10, 47, 48)

Close to the preceding species, *H. spinitibialis*, by general facies, wing reduction and wing pattern (basal white spot of corium further reduced than depicted in fig. 7c), similar gula and paramere, and straight hind tibia in the female. The male is characterized by stronger curved hind femur and tibia (fig. 47); consequently, the hind leg has a remarkably arched appearance, which obviously plays a role in holding the fe-



Figs. 21—24. Genital structures; 21, *Hebrometra bongaensis*, inflated phallus and genital segments; a, right lateral view; b, endosoma, dorsal view; c, ventral view; 22, *Hebrus ruficeps*, inflated phallus; left, sinistral lateral view; right, dorsal view; 23, *Hebrus ruficeps*, non-inflated phallus, dorsal view with left paramere; 24, *Hebrus pusillus*, idem. (co, conjunctivum; ds, ductus seminis; es, endosomal strut; p, paramere; phb, phallobase; phth, phallotheca; pro, proctiger; py, pygophor; rm, retractor muscle; vss, vesical sclerite).



Figs. 25, 27—29. *Hebrus pusillus*; 26, *Hebrus ruficeps*; 25, endosoma of inflated phallus, dorsal. 26, 27a, right view of genital segments; 27b-d, abdominal apices of pairs in copula; d, ♂ and ♀ somewhat pulled apart to show the torsion of the ♂ capsule and the intrusion of the phallus apically in the ♀ ovipositor. 25, inflated phallus, right lateral view. 29, ♂, ♀ genital structures fixed in copula, ♀ viewed from the right lateral side (note that the ♂ pygophore is rotated 180°). (ds, ductus seminis; es, endosomal strut; gwth, gutter-shaped wall thickening; gy, gynatrium; ov, ovipositor; pro, proctiger; py, pygophore; sfc, secondary fecundation canal; sp, spermatheca; vs, vesica; vss, vesical sclerite).

male during copulation. The hind femur is longer (width of pronotum/femur length is 1.1, against 1.56 in *H. spinitibialis*) and bears a row of tubercles along its inner side (figs. 47, 48). The row of conspicuous spines of the hind tibia is longer, reaching nearly the apex (fig. 9b). Front femur with about eight pegs, front tibia with a row of blunt pegs (fig. 9a). Antennal formula as in *H. spinitibialis*. Despite the strong resemblance to the preceding species, *H. gidsbaensis* has looped struts within the endosoma of the penis. Length of 5 ♂: 2.5—2.7 mm; of 5 ♀: 2.5 mm (i.e. 0.1 mm larger than the preceding species).

Material. Holotype ♂: Gidsha valley, 23.xi.1969. Paratypes, idem, 7 ♂, 11 ♀. Holotype and paratypes in the author's coll.; paratypes in the coll. of Linnavuori, the Africa Museum, Tervuren, the Muséum National d'Histoire Naturelle, Paris, the Zoologisk Museum, Copenhagen, and the Rijksmuseum van Natuurlijke Historie, Leiden.

The Gidsha is a flat, open, wet, grassy valley at an elevation of 2400 m halfway Bonga and Shappa. The *Hebrus* species was collected along a rivulet fed by a nearby spring. That it belongs to a valid species, reproductively isolated from its close relative *H. spinitibialis*, is strengthened by the fact that the latter species also occurred in the same habitat. Both species, *H. gidsbaensis* and *H. spinitibialis*, were found in closer association with running water than the other *Hebrus* species treated in the present paper.

Hebrometra n. gen.

Type species: *Hebrometra bongaeensis* n. sp.

Description

Slender, parallel-sided body, three times as long as wide, total length varying from 2.5—3.0 mm. Antennae and legs longer than in the genus *Hebrus*. All constituting parts, inclusive of the pretarsus, contribute to the greater length of the legs. Third tibia 1.1—1.3× longer than the pronotal width. Hind femur and tibia straight in both sexes. Ratio: width of head/length of first antennal segment is: 1.4—1.5 (in *Hebrus*: 1.7—2.5). Third antennal segment \pm 1.2 longer than first segment (subequal in *Hebrus*). (The elongate body shape and associated lengthening of appendages is sometimes not so pronounced (see p. 18), in which case metrical conditions are intermediate with those of typical *Hebrus*). Last segment of antenna with a pseudoarticulation (fig. 11a, b), and with a cluster of preapical sen-

sory pegs (as in *Hebrus*, fig. 10). General colour dull blackish. Bucculae only weakly developed (fig. 16). Head with a seta (probably sensory) inserted on tubercle anteriorly of eye (fig. 16, arrow), in addition to the three pairs of trichobothria. Ratio pronotum width/pronotum length: 1.5—1.6 (in *Hebrus* ca. 1.8); pronotum with a more distinct anterior collar than in *Hebrus*. Paramere elongated, with median process (fig. 13). Endosoma of phallus largely membranous, with only two, tiny apical sclerites (fig. 21).

Other external and internal structures (reproductive organs, metasternal scent gland, salivary gland) not differing from typical *Hebrus*, although the principal salivary gland of the type species has a more elongated posterior lobe and a seemingly unicellular anterior lobe.

I decided to erect a new genus for the three species from Ethiopia listed below, on the basis of three character states, which separate it from the genus *Hebrus*:

1) body elongate with distinctly elongated appendages, for ratios see above (in *Hebrus* the body length is 2.1—2.5 times the greatest width of the pronotum, and the hind tibia is subequal to or shorter than the pronotal width). The lengthening of *Hebrometra* refers mainly to the abdomen, head and pronotum remaining more or less of the original *Hebrus*-type. The three species collected by me appear to be adapted to the sprinkle zone under and beside waterfalls. Label records of abundant material from other parts of Africa all point to a similar type of madiculous habitat. I found the species only in a narrow, shaded zone, walking on a thin layer of water running over black rocks covered with sparse moss and algal patches, often also on wet vertical cliffs and dark gravel. The long-legged condition and the longer antennae may be an adaptation to this niche. Other hebrid species mentioned in this paper, as well as *Microvelia* spec. (Veliidae), lived very close to *Hebrometra*, but sharply separated from it on stagnant water or not-flooded substrate. In all localities in Ethiopia, *Hebrometra* was accompanied by *Saldula jibafana* Brown (Saldidae); sometimes both insects were entirely intermixed.

2) Presence of a seta inserted on an elevation in front of the eye. The same character occurs also in the oriental hebrid genus *Timasius*, which has superficial resemblance with *Hebrometra* and which lives under similar conditions (N. N. Andersen, pers. comm.).

3) Bucculae weakly developed (fig. 16). In all other hebrids the bucculae seem to be well pronounced (fig. 2).

4) Paramere elongate (figs. 13—19).

I consider these four characters derived in comparison with their respective conditions in *Hebrus*. Moreover, the adaptive shift towards the very humid restrictive zone bordering waterfalls warrant the distinction of a separate clade. Provisionally, *Hebrometra* could readily be evaluated as the sister group of *Hebrus*. In considering cladistic relations of hebrid genera, Andersen (1981) also suggests the possibility that *Hebrometra*, in spite of its distinctive habitus, could have arisen from some subordinate group within *Hebrus*. The recent discovery of a new *Hebrometra* species with one of the four most distinctive generic characters only weakly developed (see p. 18) favours this view. If the *Hebrometra* clade is classified as separate genus, as proposed here, the genus *Hebrus* then becomes a paraphyletic group. The fact that my investigation of only four waterfalls, over a distance of about 40 mi. in the Kaffa province of Ethiopia, yielded three species of the new genus, suggests that this particular habitat harbours more species in Africa.

***Hebrometra bongaensis* n.sp.**
(figs. 12a, 13b, 16a, 17, 21, 49—53)

Body, predominantly dull black, clothed with short adpressed hairs. Head and pronotum often with an inconspicuous blue-metallic hue; for cuticular details see scanning micrographs (figs. 50—53). Head with several erect hairs in addition to the trichobothria and the microsetae. Buccula weakly developed (fig. 16a); rostrum light-brown, apex reaching level of hind coxae. Vertex behind eyes, collar of pronotum, acetabulae, and sometimes also lateral edges of pronotum, yellow-brownish; velvet spot between eye and posterior trichobothrium. Apex of triangular metanotum weakly notched (fig. 51). Forewings reaching wholly or nearly the apex of abdomen, black, with grey-pruinose basis of exo- and endocorium, endocorium neatly demarcated from membrane; whole surface of corium regularly covered with short, golden-silvery hairs, adpressed in caudal direction; membrane shining, irregularly blotched with black and pruinose areas; a lateral oblique line and an apical spot whitish. Extremities unicolorous light brownish. Antenniferous tubercle prominent; antennal formula: 9:7:11.5:13; segments with short hair-dress, and some scattered, semi-

long, erect setae on 2—4. Legs slender and long, with short pubescence; length in mm of femur, tibia and tarsus (excluding pretarsus) of leg 1:20—21—7.5, of leg 2:24—25—8, of leg 3:30—36.5—11, respectively; cleaning comb of tibia 1 with ca. 17 spines, of tibia 2 with ca. 9 spines, of tibia 3 poorly developed. Paramere (fig. 13) with rounded apex and triangular median process, bearing a sensillum. The phallus in artificially inflated condition is shown in fig. 21a—c. Length of 8 ♂: 2.7—3.0 mm, of 7 ♀: 2.9—3.0 mm.

Holotype ♂: Bonga waterfall, 22.xi.1969. Paratypes, idem, 9 ♂, 5 ♀, 1 larva V; idem, 1 ♀, 23.i.1973 (leg. Y. Jongema); 6 ♂, 5 ♀, 70 km from Jimma en route to Addis Abeba, 23.x.1969; 1 ♂, 2 ♀, Sakka, 20 km South of Jimma, 19.x.1969. Holotype and paratypes in the author's coll.; paratypes in the coll. of Linnavuri, the Africa Museum, Tervuren, the Zoologisk Museum, Copenhagen, the Muséum National d'Histoire Naturelle, Paris, and the Rijksmuseum van Natuurlijke Historie, Leiden.

***Hebrometra pelengei* (Poisson, 1954)**
(= *H. mancinii* Poisson, 1955, nov. syn.).
(figs. 12b, 14, 16c, 18)

Hebrus pelengei was originally described from Zaire (Gorges de la Pelenge, 1.250—1.600 m, 20—23.vi.1947). Of the series of 38 specimens I was able to study 1 ♂ and 1 ♀ deposited in the Smithsonian Institution, Washington, and 4 ♂ in the Tervuren Museum. Since Poisson did not designate types, I selected 1 ♂ as the holotype (deposited in Tervuren) and labelled the remaining specimens as paralectotypes. The species is characterized by complete lack of hairs on the endocorium. Examination of the type of *Hebrus mancinii* from Addis-Abeba, Ethiopia (in Museo Civico di Storia Naturale, Genua) did not reveal specific differences with *H. pelengei*. The drawings of the parameres of *H. pelengei* (Poisson, 1954, fig. 4c) and *H. mancinii* (Poisson, 1955, fig. 4b, c) suggest some dissimilarities, but these fall within the range of variability which I found in conspecific material from localities in Zaire and Ethiopia (see figs. 14 and 18). I collected 1 ♂ and 1 ♀ in Jimma, 18.x.1969; idem 1 ♂, 5.x.1969; idem, 1 ♀, 1.xi.1969; 1 ♂, Sakka, 20 km south of Jimma, 19.x.1969 (simultaneous with *H. bongaensis*). Some specimens have the endocorium entirely hairless as in the type series of *H. pelengei*, others possess a central tuft of a few transversal silvery scales.

H. pelengei differs in the following respects from *H. bongaensis*: Last antennal segment 1.4–1.5× the length of third segment (1.1–1.2× in *H. bongaensis*). Bucculae less developed (fig. 16c). Apex of metanotum brownish. Base of endocorium white, remainder part brown and not well demarcated from membrane, without hairs or with only a few silvery hairs in the centre (fig. 12b). Exocorium dark with adpressed hairs on the veins and a strip of minute silvery hairs on the area between the veins. Male genital capsule shorter and with longer setae. Paramere with nasiform median process of varying shape (figs. 14, 18) without sensillum on the median process.

***Hebrometra niemeri* n. sp.**
(figs. 11, 12c, d, 15, 16b, 19)

Differing from the previous two species in the shape of the bucculae (fig. 16b) and wing-pubescent (fig. 12c). The basis of the endocorium is white like in *H. pelengei*. The endocorium bears a dense layer of transverse silvery setae; the area between the exocorial veins also with silvery setae, oriented under an angle different from the half-long golden setae on the veins. Paramere varying (fig. 19 a–e), mostly with blunt apex and irregularly notched median process without sensillum. The antennal formula and tendency for more brownish areas on pronotum and metanotum is more like in *H. pelengei*. Length varying from 2.5–2.8 mm (♂) and 2.9–3.3 mm (♀).

It is almost certain that this species refers to *Hebrus mancinii* f. *panganii* Poisson, 1963, although I was unable to study the type material. The holotype was said to be deposited in the Muséum National d'Histoire Naturelle, Paris, but I was kindly informed by dr. Carayon that it is not available there. However, Poisson's description clearly mentions the presence of the silvery hair-layer on the endocorium. The type material is from the same mountain (Usambara) in Tanzania, from which now abundant recent material is available. The reason that I introduce here a new name is the following. Above it was concluded that *H. mancinii* is a synonym of *H. pelengei*. The Usambara material described as forma *panganii* is clearly another species. According to the International Code, 1961, article 17, a name published as "variety" or "form" may only remain available as species name, if it was published before 1961.

I name the species *Hebrometra niemeri* in memory of my host in Jimma, Hugo Niemer

(WHO, med. doct.) who, with his daughter, tragically perished in Malawi in 1976. The species has a wide south-eastern distribution from Ethiopia up to the southern edge of the Cape Province. The great majority of the Tanzanian specimens collected in the Usambara Mountains at different altitudes are characterized by long setae on the inner corial vein and along the oblique margin of the membrane (fig. 12d); third antennal segment two times the length of segment two or slightly more; legs dark shaded; membrane reaching the apex of the abdomen. Another population from Tanzania, living on Mt. Rungwe at a distance of some 700 km from the Usambara Mts., has no such obvious long setae on the corium, the third antennal segment less than two times the length of the second segment, legs lighter coloured, and the membrane somewhat reduced. The parameres in both populations are not discriminative. In spite of the rather constant differences mentioned I refrain for the present from dividing up the species in subspecies. A long series from Uluguru Mts., about half-way the two localities mentioned above, is more or less intermediate in the characters recorded above, suggesting clinal variation. Other material from Ethiopia, Malawi, and S. Africa lacks the long corial setae, or has the setae of intermediate length, whereas other characters resemble those of the Usambara specimens.

Material. Ethiopia: Holotype ♂, Bonga, 22.xi.1969, in author's coll. Paratypes, idem, 2 ♂; Tanzania: East Usambara Mts., Sigi River, 750 m, 4 ♂, 4 ♀, numerous larvae, 15.vii.1980, leg. M. Stoltze & N. Scharff (in Zoological Museum, Copenhagen); East Usambara Mts. Amani, Dodwe Stream, 1000 m, 3 ♂, 1 larva, 5.viii.1979, leg. M. Stoltze (in Zool. Mus. Copenhagen); Amani, seeps near Sigi river, CL 977, 34 ♂, 18 ♀, 3 larvae, 13.iii.1979, leg. J. T. Polhemus (in Polhemus coll.; Cobben coll.); idem, Sigi river, CL 999, 6 ♂, 5 ♀, 13.iii.1979, leg. J. T. Polhemus; idem, Dodwe Stream, CL 992, 1 ♀, 12.iii.1979, leg. J. T. Polhemus. Zaïre: Kivu, Bulingwe (Runingo), Itombwe plane, Est (pierre mouillée), 6 ♂, 10 ♀, 6.vi.1958, leg. G. Marlier (in Mus. Tervuren); Uvira, Vallée de la Mugadja (rocher ruisselant), 3 ♂, 2 ♀, 26.v.1958, leg. G. Marlier (in Mus. Tervuren); Uvira, Mulenga-Lemera, 5 ♀, 19.i.1955, leg. G. Marlier (in Mus. Tervuren). West Usambara Mts., Bumbuli, 1300 m, 8 ♂, 6 ♀, 3 larvae, 1.viii.1980, leg. M. Stoltze & N. Scharff (in Zool. Mus. Copenhagen and Rijksmus. Nat.

Hist., Leiden); Mt. Rungwe SW. 1900 m, 13 ♂, 1 ♀, 1 larva, 20.viii.1980, leg. M. Stoltze & N. Scharff (in Zool. Mus. Copenhagen and Rijksmus. Nat. Hist., Leiden); Mts. Uluguru, Morning Side (sur roche ruisselante), 1600 m, 16 ♂, 27 ♀, 21—29.vi.1971, leg. L. Berger, N. Leleup, J. Debecker (in Mus. Tervuren). S. Africa: Natal, Cascades, Mont aux Sources, 1 ♂, 1 ♀, 5.iii.1968, leg. J. Munting (coll. ACNC); Natal, Gillits, Pinetown district 1 ♀, 21.xi.1963, leg. B. & P. Stuckenberg; Cape Province, Grahamstown, 1 ♀, 1924, leg. M. L. Winslow; idem, 1 ♀, 22.ix.1952, leg. A. J. M. Carnegie (coll. USNM); Rust in Vrede, Swartberg, nr. Oudtshoorn, 1 ♀, 1.i.1927, leg. G. E. Hutchinson (coll. BMNH).

A NEW *HEBROMETRA* SPECIES FROM MALAWI
WITH A MORE *HEBRUS*-LIKE FACIES

Hebrometra malawiensis n.sp.
(fig. 20)

General facies like typical members of the genus *Hebrometra* (see p. 15 and fig. 12) but without such pronounced elongated appendages. Dull, black, with short pubescence and several dark erect semilong hairs on head; pronotum with weakly metallic blue shine. Buccula only weakly developed (fig. 20d). Distal lateral edges of pronotum, underside of pronotal collar, acetabula and rostrum brownish. Antennae dark brown with short pubescence; segment 2 with some erect longer setae like on segments 3 and 4; last segment with pseudoarticulation; ratio of segments of holotype (♂) and paratype (♀), respectively: 6:5:6.5:11 and 7:5:7:10. Legs brownish, femora proximally yellowish brown; third tibia basally very weakly sinuate in both sexes; ratio length tibia 3 to maximal width of pronotum 0.9—1.0. Pseudoscutellum (fig. 20b) more clearly bordered and tapered than in other *Hebrometra* spp. (fig. 20c). Forewing black, only extreme base of endocorium light; regular golden pubescence on veins, silvery hair-cover in between veins (much like in *Hebrometra niemer*, fig. 12c). Paramere elongated, of the *Hebrometra*-type (fig. 20a). Phallus with only two apical sclerites. Length and width of ♂: 2.1 mm, 0.8 mm; of ♀ 2.4 mm, 0.98 mm.

Holotype ♂: Malawi, Zomba Plateau, CL 985, 1.iii.1979, leg. J. T. Polhemus (in Polhemus coll.). Paratypes, idem, 7 ♂, 7 ♀ (also in author's coll.).

Discussion: *H. malawiensis* is in several respects intermediate between typical *Hebrus* spp.

and the three species of *Hebrometra* described in this paper. The ratio width of head: length of first antennal segment is 1.8 (1.7—2.5 in *Hebrus*, 1.4—1.5 in *Hebrometra*). The ratio length of tibia 3: width of pronotum is 0.9—1.0 (0.8—0.9 in *Hebrus*, 1.10—1.3 in *Hebrometra*). The ratio pronotum width: pronotum length is 1.7—1.8 (1.8—1.9 in *Hebrus*, 1.5—1.6 in *Hebrometra*).

On the basis of the general facies, weakly developed buccula and shape of paramere, this species is assigned to *Hebrometra*. The setiferous tubercle in front of the eye is less pronounced and the appendages are less elongated than in typical *Hebrometra*. On the basis of this character state, I conclude that *H. malawiensis* is one of the first representatives of the *Hebrometra* clade in which the elongation of the legs as a further adaptation to the sprinkle zone has not yet been fully expressed (see p. 15).

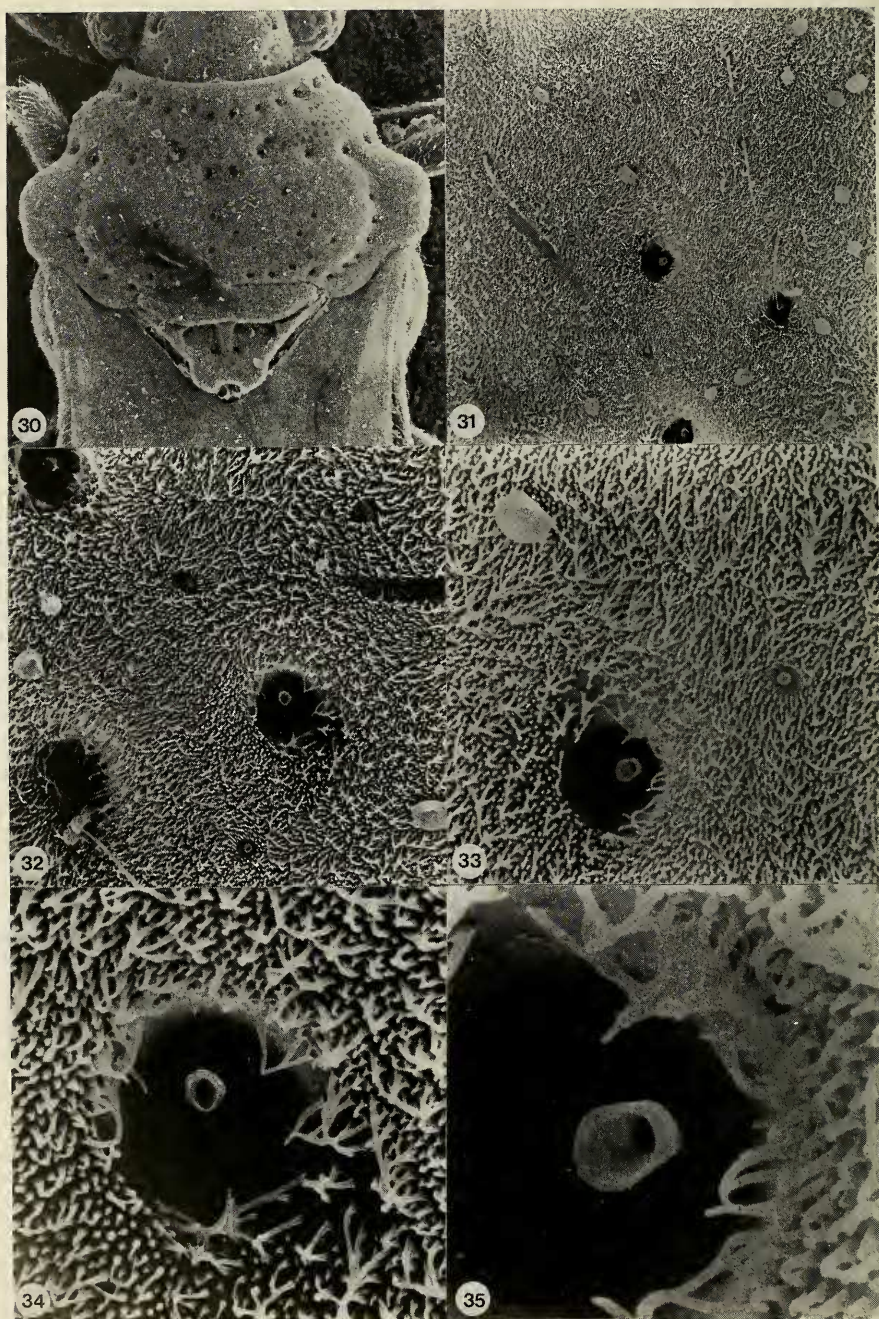
ACKNOWLEDGEMENTS

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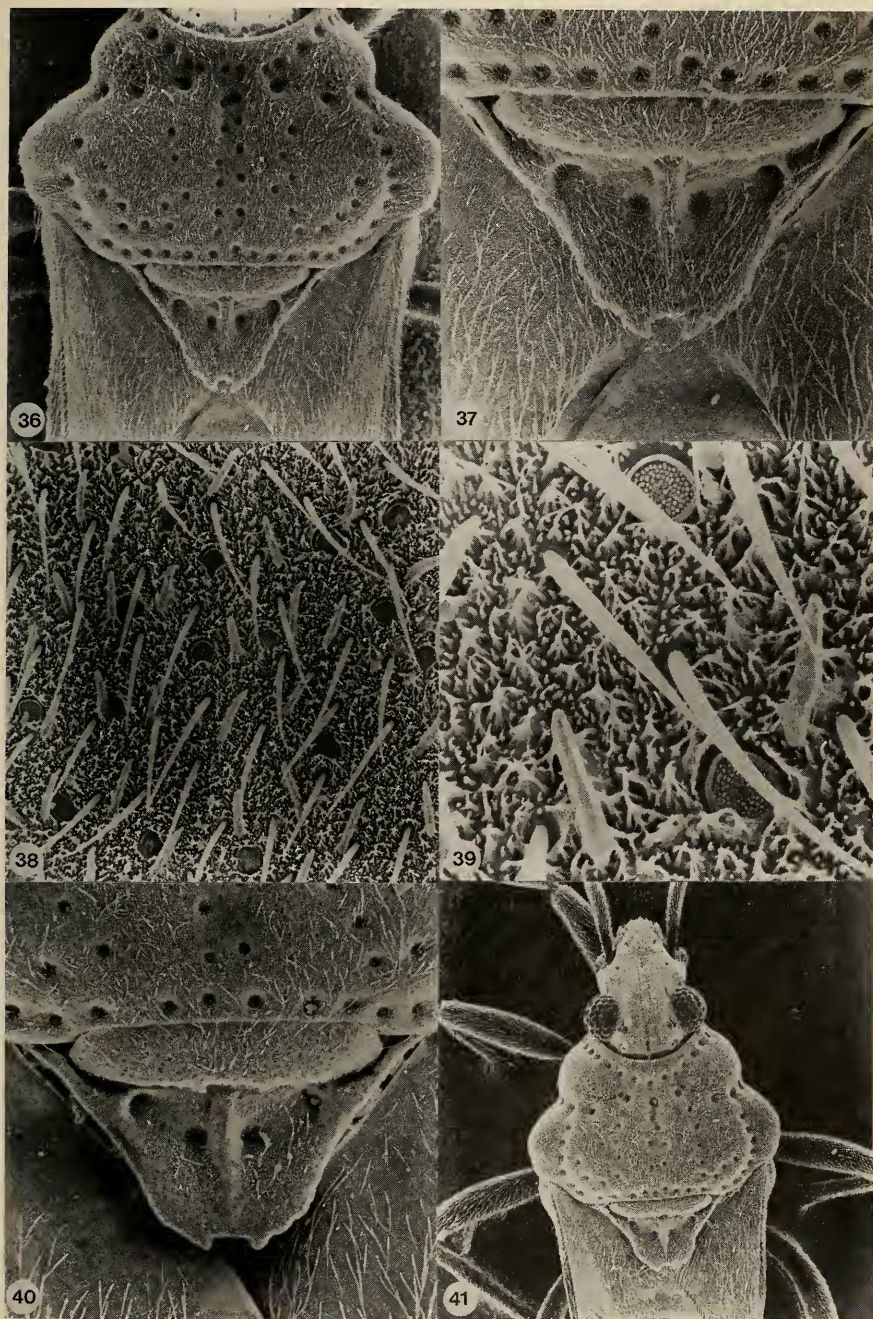
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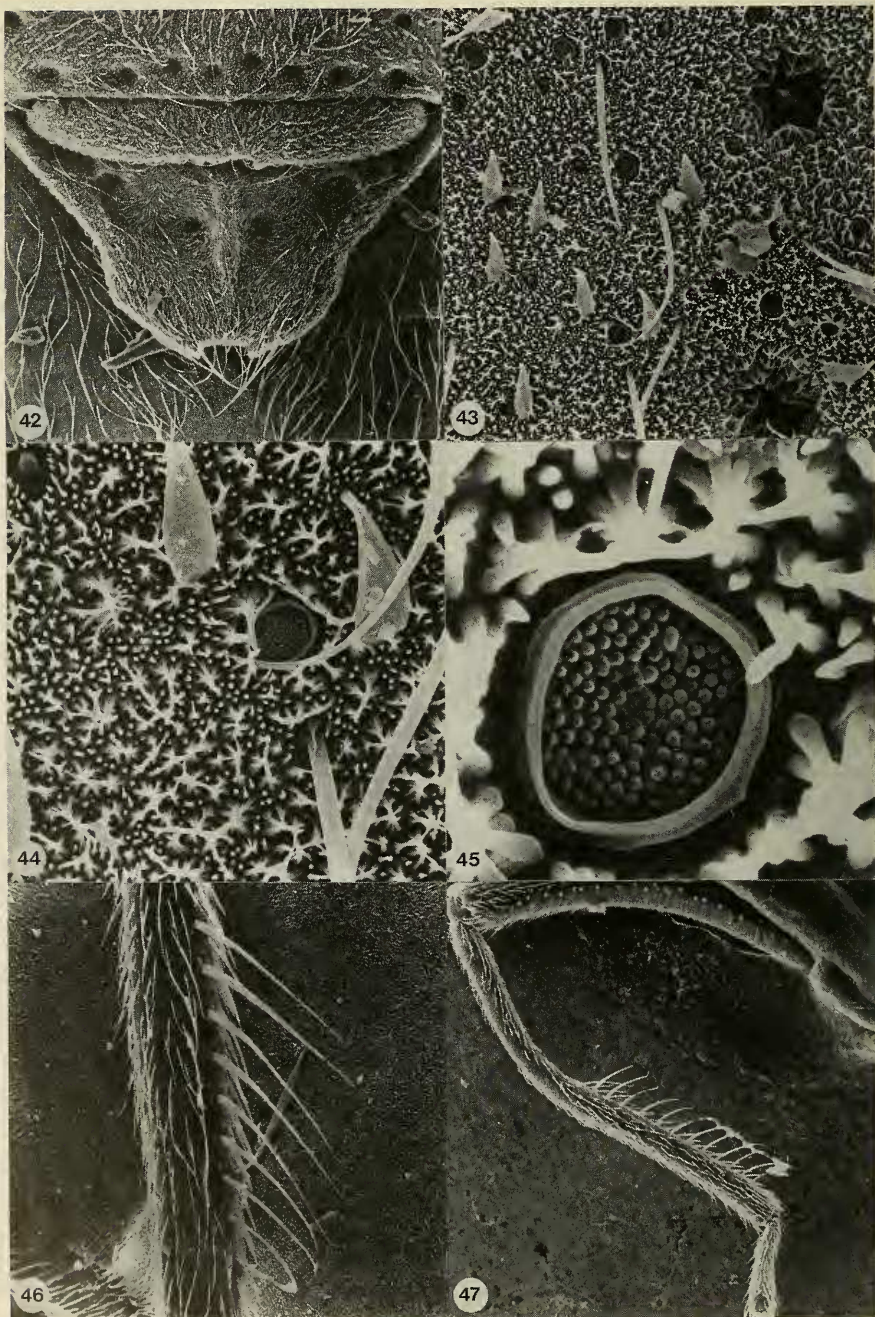
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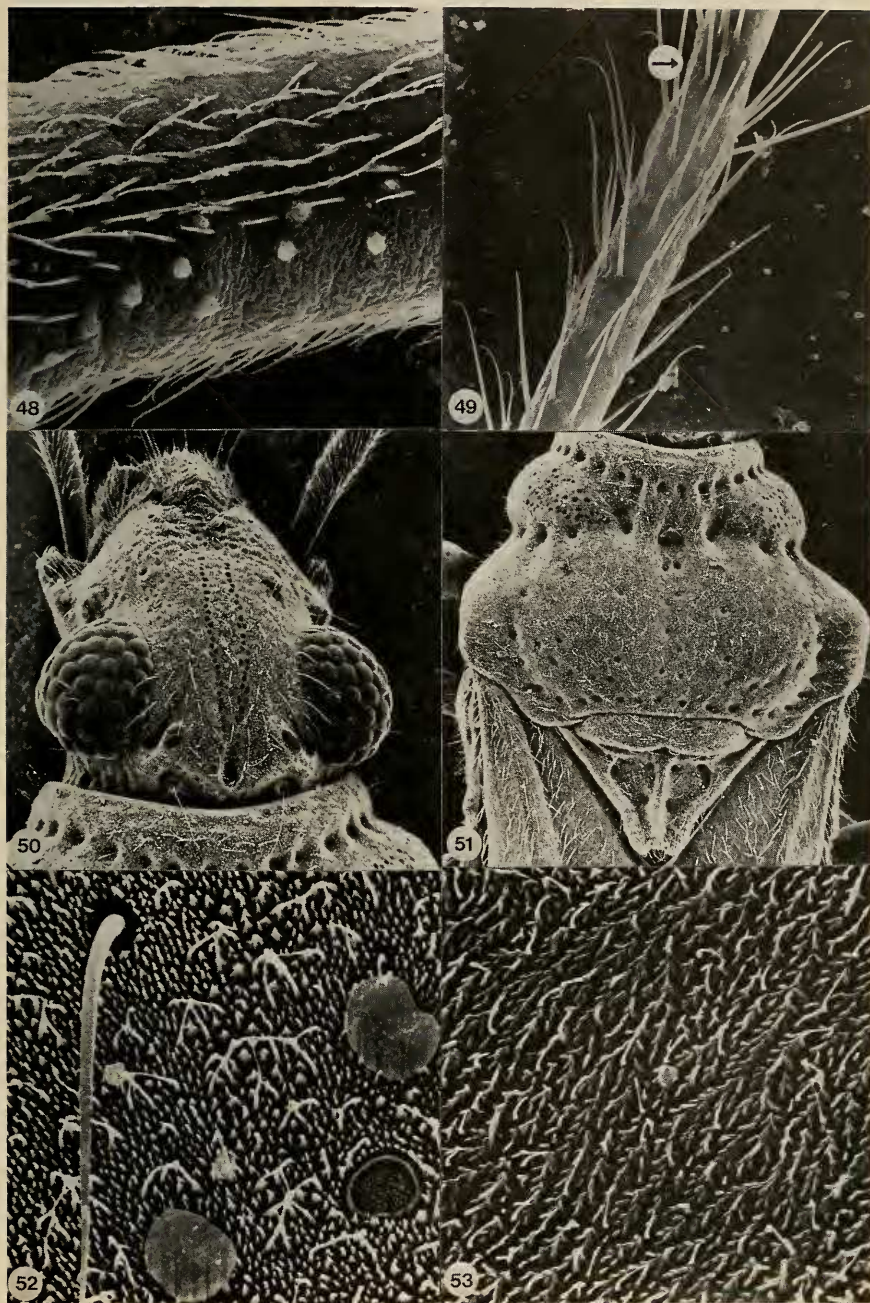
Figs. 30—35. *Hebrus gerardi*, scanning electron micrographs of cuticular structures; 30, dorsal view of thorax (80 \times); 31—35, detail of right-mid part of pronotum; 31 (300 \times), 32 (583 \times), 33 (1166 \times), 34 (1750 \times), 35 (5830 \times).



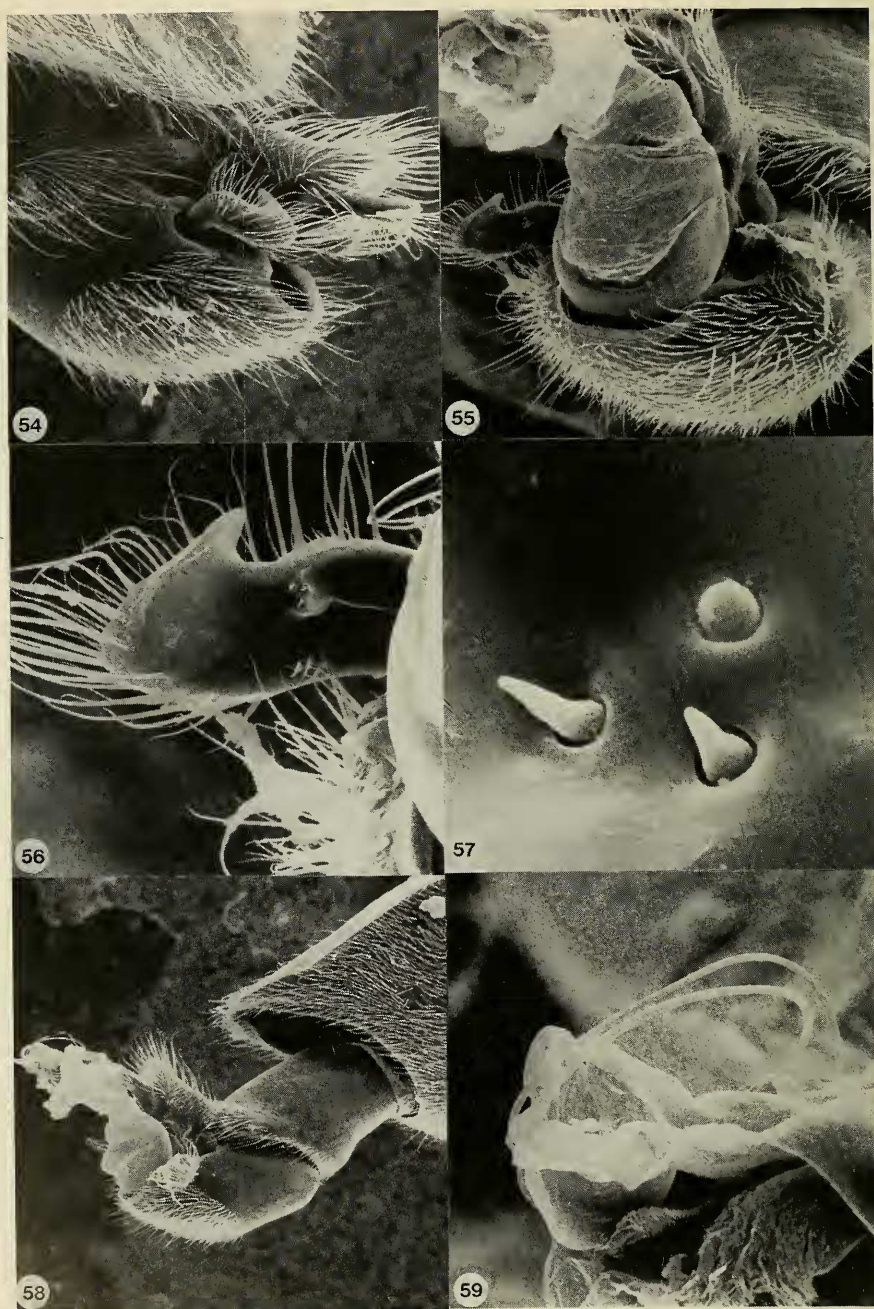
Figs. 36—41. Scanning electron micrographs; 36—39, *Hebrus pseudopusillus*; 36, dorsal view of thorax and wing bases (58 \times); 37, metanotum (116 \times); 38, 39, detail of right-mid part of pronotum, 38 (583 \times), 39 (1750 \times); 40, *Hebrus katompei*, metanotum (116 \times); 41, *Hebrus spinitibialis*, anterior part (32 \times).



Figs. 42—47. Scanning electron micrographs; 42—46, *Hebrus spinitibialis*; 42, metanotum (116 \times); 43—45, detail of right-mid part of pronotum, 43 (250 \times), 44 (1750 \times), 45, sieve-pore (5830 \times), 46, setal comb of δ hind tibia (175 \times); 47, *Hebrus gidsbaensis*, δ hind leg (58 \times).



Figs. 48—53. Scanning electron micrographs; 48, *Hebrus gidshaensis*, pegs on ♂ hind femur (350×, see Fig. 47); 49—53, *Hebrometra bongensis*; 49, last antennal segment with striation of pseudojoint, arrow (350×); 50, head (93×); 51, thorax (57×); 52, endocorium (1750×); 53, microsetae on membrane (1750×).



Figs. 54—59. Scanning electron micrographs; *Hebrus pusillus*, specimens from the Netherlands, male genitalia; 54, left view of genital capsule (175 \times); 55, posterior view of intromittent organ with left paramere (204 \times); 56, inner surface of left paramere (583 \times); 57, sensilla on inner outgrowth of paramere (5830 \times); 58, dextral side of genital segments with artificially erected phallus, apex of vesica ruptured so that internal struts are exposed (87 \times); 59, vesical struts (583 \times).